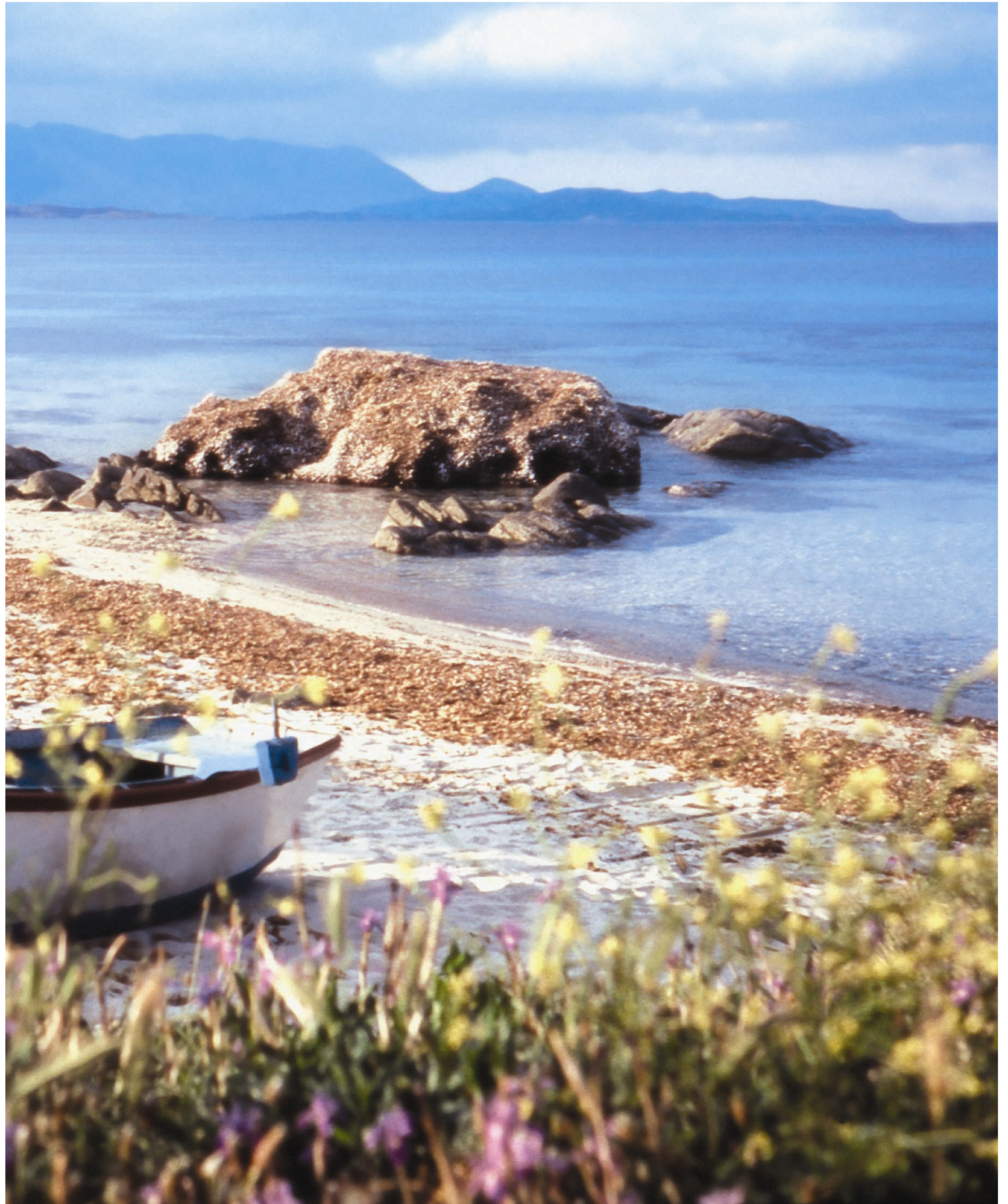


Culligan®

Desalination



Culligan: World Leader in Water Treatment

Desalination

How it works?

In many parts of the world, freshwater is a scarce resource. There are many reasons for this including; increasingly prolonged periods of drought caused by climate change, intensive farming and irrigation practices which can exhaust resources, the gradual pollution of groundwater through industrial and agricultural activity and, concentrations of holidaymakers during summer months.

All this must be added to growth in world population. There are now 6 billion people living on the planet and forecasts suggest there will be 9.5 billion by 2050. As natural supplies of freshwater and their quality decline we must look to other sources to meet the constantly growing demands. We can meet these demands by turning to the sea and brackish water and using desalination equipment.

Over the last fifty years a variety of different desalination techniques have been developed and applied. The process is based on the principles of reverse osmosis. Our solutions can achieve excellent quality results, with a limited impact on the environment and a clear cost benefit ratio.



The Technology

Modern osmotic membranes offer excellent performance. The quantity of drinking water produced relative to the amount of water treated, known as the recovery ratio, can be as high as 50% for sea water and 80% for brackish water. Salinity of the water can be reduced by more than 99%.

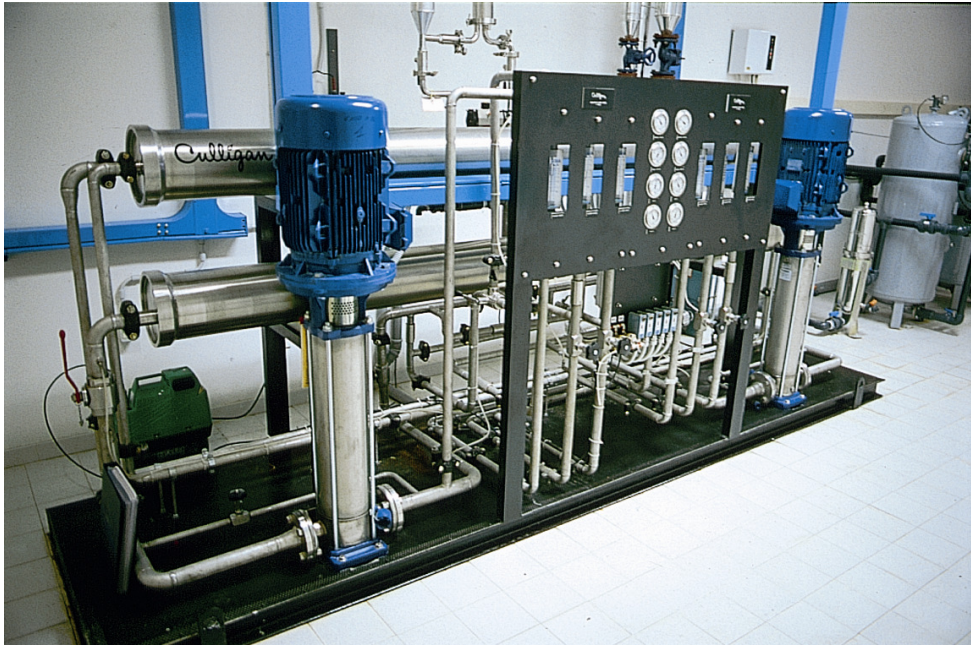
Plant Management

By using the latest technology, we can build a high degree of automation into the plant. This reduces the need for specialist personnel to operate the plant. All plant can be supported with Culligan's extensive technical assistance network, which can provide a first class service anywhere in the world.



The Investment

The quality performance of these modern reverse osmosis plants means the cost of each cubic metre of water produced is significantly lower than if it were produced using an alternative process. A reverse osmosis desalination plant can supply an excellent quality of water for many years, before the membrane has to be renewed. It is important to note, that in order to reduce operating costs, including electrical power used to pressurise water flow, an energy recovery system may be used.



In addition to the economic and qualitative advantages, there are a number of other reasons why reverse osmosis technology is the preferred solution for desalination plants. Reverse osmosis plants are characterised by their flexibility, compact design and modular structure.

Flexibility: a reverse osmosis plant can be activated with a few simple operations, it can be deactivated or put on stand by just as easily. This makes it easy to adapt the supply of drinking water to suit changes in demand.

Compact Design: reverse osmosis plants have a smaller footprint than other types of distillation equipment available.

Modular Structure: it is always possible to add extra membranes and pumps to an existing system in order to meet growing demands.

Add to this Culligan's 70 years experience treating water and you can be assured your plant will provide the service levels and reliability you require for the duration of its operation.



The Treatment Process

The seawater desalination process used in Culligan systems normally includes the following stages.

- **Pretreatment**
- **Chemical conditioning**
- **Reverse osmosis plant**

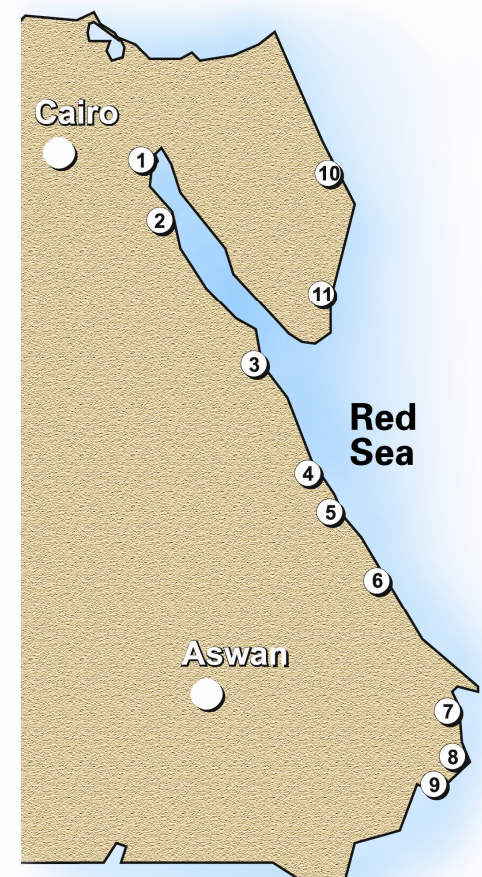
The specific features of each plant, types of membrane utilised and site parameters all vary. Each system is bespoke and set up to meet specific business requirements, established by analysis the untreated water. The plant includes a system for rinsing each modular at shutdown and a back-up system for electrical power failure.

- **Remineralisation** where appropriate, to bring the treated water up to desired final quality
- **Final disinfection**

There are a number of Culligan seawater or brackish water desalination plants currently in use throughout the world. In recent years a number of plants have sprung up along the Red Sea coast, to meet the increase drinking water demands on the numerous tourist resorts developing.

Culligan Plants in the Red Sea

1. Ain El Sokna
2. Ras Ghareb
3. Hurgada
4. Marsa Alam
5. Marsa Hamata
6. Marsa Hemera
7. Shalatin
8. Abu Ramad
9. Halayeb
10. Dahab
11. Multi National Force and Observer



References

Customer	City, Nation	Capacity (m ³ /day)
Antigua Water Power Authority	Crabbs, Antigua	27250
Radisson Cable Beach Resort	Nassau, Bahamas	1090
Swiss Riviera Hotel	Sinai, Egypt	500
Nirefs Fish Farm	Chios, Greece	1920
Municipality of	Paxos, Greece	1 x 150—1 x 150
Municipality of	Mikonos, Greece	2000
Marriott Hotel	Bermuda	378
Hyatt Regency Hotel	Saipan, Japan	545
Ekarem Waterworks	Ekarem, Turkmenistan	1000
Esenguli Waterworks	Esenguli, Turkmenistan	2 x 750

Other installations supplying private users, hotels and holiday clubs are spread through the Caribbean, the Red Sea and all around the coasts of Italy, Spain, Tunisia, Greece and many other countries.



Quality Systems certified according to UNI ISO:9001